LIVERMORE LAB REPORT
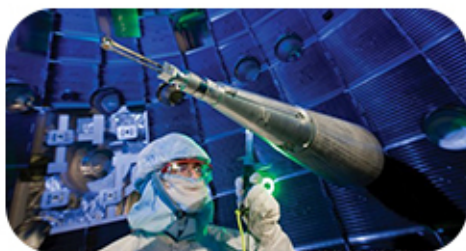
A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Nov. 11-15, 2013.

TIME   THE DRAW OF FUSION ENERGY

NIF researchers have passed a crucial milestone on the way to their ultimate goal of achieving self-sustaining nuclear fusion.

"The question as to whether you can coax one of these very hot gasses into making serious amounts of fusion energy from my point of view is pretty clear: You can do it." That's how Rob Goldston, who directed Princeton's plasma physics lab for a decade, sees the future for nuclear fusion. And he's not alone.

Recently, the National Ignition Facility "reached a milestone by producing more energy in a fusion reaction than was needed to start that reaction."

Millions of venture dollars are pouring into private companies seeking to achieve the race to achieve fusion. One investor explains part of the attraction: "It's an investment to potentially bring something about that would really transform the world."

To read more, go to *Time Magazine*.

NATURE WORLD NEWS   THE RAIN IN SPAIN

Lawrence Livermore scientists have found that observed changes in global precipitation are directly affected by human activities.

The rain in Spain may lie mainly on the plain, but the location and intensity of that rain is changing not only in Spain but around the globe.

A new study by Lawrence Livermore National Laboratory scientists shows that observed changes in global precipitation are directly affected by human activities and cannot be explained by natural variability alone. The research appears in the Nov. 11 online edition of the *Proceedings of the National Academy of Sciences*.

Emissions of heat-trapping and ozone-depleting gases affect the distribution of precipitation through two mechanisms. Increasing temperatures are expected to make wet regions wetter and dry regions drier; and changes in atmospheric circulation patterns will push storm tracks and subtropical dry zones toward the poles.

"Both these changes are occurring simultaneously in global precipitation and this behavior cannot be explained by natural variability alone," said LLNL's lead author, Kate Marvel. "External influences such as the increase in greenhouse gases are responsible for the changes."

To read more, go to Nature World News.

LLNL's Anantha Krishnan and Ayasdi co-founder Gunnar Carlsson sign a memorandum of understanding to tackle big data.

Lawrence Livermore and Ayasdi are collaborating to pursue the creation of novel applications on a range of projects in the areas of energy, climate change, medical technology and national security.

The collaboration with Ayasdi is part of LLNL's effort to apply new data analysis capabilities and ensure the Laboratory's leadership in modeling, simulation and big data computing. LLNL will use Ayasdi's platform to discover and explore insights from data and build new applications for LLNL's research programs based on those discoveries.

"A big challenge for many organizations today is to extract patterns, information and knowledge from large, complex and multi-dimensional data sets," said Anantha Krishnan, director of LLNL's Office of Mission Innovation. "By combining LLNL's powerful computing and scientific infrastructure with Ayasdi's innovative machine learning platform, we aim to better understand the information in complex data sets that, previously, we could only comprehend in limited or abstract ways."

To read more, go to *Power Engineering*.

IT'S LIKE SPAGHETTI
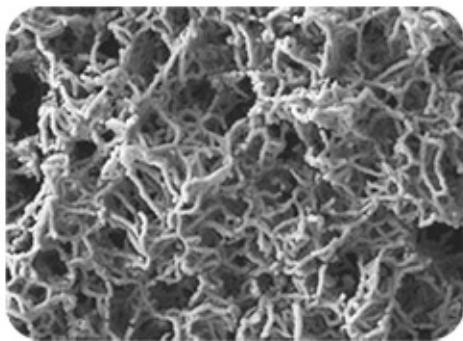
The top view of the jungle canopy of nanotubes creates sensitive spots for detecting everything from biological agents to explosives.

Researchers from Lawrence Livermore and the Swiss Federal Institute of Technology have developed a new method of using nanotubes to detect molecules at extremely low concentrations, enabling trace detection of biological threats, explosives and drugs.

The joint research team, led by LLNL Engineer Tiziana Bond and ETH scientist Hyung Gyu Park, are using spaghetti-like, gold-hafnium-coated carbon nanotubes (CNT) to amplify the detection capabilities in surface-enhanced Raman spectroscopy (SERS).

The hafnium coating enables the "bunching" of gold nanotubes that creates a thick canopy full of sensitive spots for detection.

To read more, go to [Nanotechnology Now](#).

Catalyst, recently installed at Lawrence Livermore, will serve research scientists and provide a proving ground for new HPC, Big Data technologies and architectures.

Lawrence Livermore National Laboratory, in partnership with Intel and Cray, has created a unique high performance computing (HPC) cluster that will and provide a proving ground for new HPC and big data technologies and architectures.

"As the name implies, Catalyst aims to accelerate HPC simulation and big data innovation, as well as collaborations between the three institutions," said Matt Leininger, deputy of Advanced Technology Projects for LLNL. "The partnership between Intel, Cray and LLNL allows us to explore different approaches for utilizing large amounts of high performance non-volatile memory in HPC simulation and big data analytics."

The Catalyst resource, a Cray cluster supercomputer, will be shared between the three partners. System access will be managed through LLNL's High Performance Computing Innovation Center (HPCIC), whose mission is to work with industrial partners in the development of computing solutions for America to compete effectively in the 21st century global economy.

Delivered to LLNL in late October, Catalyst is expected to be available for limited use this month and general use by December.

To read more, go to *Lab Manager*.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send e-mail